DOCUMENT RESUME

ED 261 086 TM 850 510

AUTHOR McCart, Carol L.; And Others
TITLE Learning Styles among Established Professionals.
PUB DATE 3 Apr 85
NOTE 31p.; Paper presented at the Annual Meeting of the American Educational Research Association (69th, Chicago, IL, March 31-April 4, 1985).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Style; Curriculum Development; *Experiential Learning; Learning Processes; *Learning Theories; Post Secondary Education; Professional Continuing Education; *Professional Personnel; Self Evaluation (Individuals)
IDENTIFIERS Continuing Professional Education Project PA; *Kola (D A); *Learning Styles Inventory

ABSTRACT

As part of the Continuing Professional Education Development Project at Pennsylvania State University, the learning styles of 148 practicing professionals (accountants, architects, clinical dietitians, and nurses) were investigated. The study objectives were: (1) to describe their learning characteristics using Kolb's Learning Style Inventory (LSI); (2) to determine, by comparison, the consistency of the attributes of these groups to the experiential learning theory on which the LSI is based; and (3) to assess whether knowledge about learning styles can be useful in the design of continuing professional education programs. The LSI is a self-description questionnaire designed to measure individual emphasis on four learning styles: concrete experience, reflective observation, abstract conceptualization and active experimentation. Intercorrelations among the four learning style scores were calculated for the total sample. Learning style similarities and differences were examined across professions using one-way ANOVA with follow-up comparisions with the Waller-Duncan K Ratio T Test. Combined scores across professions were analyzed by a 2 by 4 MANOVA. It was concluded that the LSI has some ability with groups of mature practitioners in selected professions. Guidelines for developing efficient learning packages for the four professions derived from Kolb's model for learning preferences were given. A 98-item bibliography is appended. (BS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED261086

LEARNING STYLES AMONG ESTABLISHED PROFESSIONALS

Presented at:

1985 AERA Conference
Chicago, Illinois
April 3, 1985

Carol L. McCart
William Toombs
Carl Lindsay
Mary Beth Crowe

The Pennsylvania State University
University Park, Pennsylvania 16802

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

McCart, Carol L.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

TM 850 510

LEARNING STYLES AMONG ESTABLISHED PROFESSIONALS

OVERVIEW

Perspectives

The theoretical and operational perspectives for this study have their basis in experiential learning theory as conceived by David Kolb (1976) in his formulation of learning styles. He suggests that four basic abilities underlie learning and that all four are required by learners, but in different configurations. He further asserts that individuals develop a dominant learning style within their own environmental context and that these learning styles fall into one of four basic modes. Different disciplines and career or professional paths vary in such ways as to best accommodate one of the four learning styles. Kolb, therefore, expects different areas of learning and individuals within these areas to evidence learning style patterns which are appropriate to their chosen area of study.

Kolb (1976) has developed the Learning Style Inventory (LSI) to measure differences in learning styles. This study employs that instrument to measure learning style variations among four professional groups: accountants, architects, clinical dietitians, and nurses. The setting of this research is a larger project covering five years aimed at designing learning programs derived from the conditions of practice for mid-career professionals.

Kolb (1976) also contends that individuals move through a general growth process in three broad developmental stages: acquisition, specialization, and integration. Although he says that individuals probably do not move through these stages in linear fashion, but rather proceed through successive oscillations from one stage to another, he does suggest general life-periods in which the stages manifest. The specialization stage, according to Kolb, lasts

through formal education or career training to mid-career, at which point integration occurs with a reassertion and expression of non-dominant learning styles. The study also addressed this conceptualization by examining the degree of integration evident for the four mid-career professional groups under investigation.

Intuitively one expects that the way people learn, how they define the process, and the skills they bring to it play a part in any learning event. Much of the literature on adult education calls attention to the special nature of adult learners (Knox, 1977 and 1980; Tough, 1971 and 1979; and Knowles, 1978). Similarly, reports on professional programs emphasize the particular expectations of such clients (Black, 1979). A good share of this literature catalogues the preferences adult learners bring to the learning experience, such as non-authoritarian milieu, excnange among participants, and close relation to experience. The supporting studies for the Kolb LSI indicate that differences are deeper than preference touching the key features of cognition. The theoretical base of experiential learning theory allows Kolb to construct an experiential learning model. This dialectical model describes four cognitive abilities -- concrete experience, reflective observation, abstract conceptualization, and active experimentation -- which individuals may employ in a learning situation. As discussed, he further asserts that individuals have different learning styles and that academic disciplines, associated careers, and professions are compatible with certain cognitive styles. The L.S.I. measures differences in learning styles along the two basic dimensions of abstract-concrete and active-reflective. Because of the background studies with different groups of subjects, the Kolb instrument is especially suited to a comparative analysis.

In thinking about learning programs for professionals who have already demonstrated both their native intellectual competence and their applied skills in practice, it would be valuable to have a certain knowledge of what they bring to the educational situation. At Penn State University, with support from the Kellogg Foundation, The Continuing Professional Education Development Project has built a collaborative relationship between professional associations, the practitioners who are members, the faculty of the University, and the project staff. One phase of the project involved a non-critical assessment of practice among a randomly selected group of experienced practitioners. The LSI was given at the same time under conditions that emphasized its value for self-analysis. Distinctive is the fact that the subjects are established practitioners while most of the other Kolb citations deal with subjects in a student status.

Objectives

The overall objectives of this study are defined as:

(1) To describe the learning characteristics of established practitioners in four areas: nursing, architecture, accounting, and clinical dietetics using Kolb's Learning Style Inventory (LSI).

(2) To determine, by comparison, the degree to which the attributes of these groups are consistent with the conceptualization on which the LSI is based.

(3) To assess whether knowledge about learning styles can be a useful component in the design of programs for continuing professional education.

Major Findings

For this study the subjects consist of 148 practitioners in licensed and certified professions distributed in the following way: 41 accounting, 27 architecture, 35 clinical dietetics, and 45 nursing. For the first stage of analysis comparisons within the sample were made based of descriptive statistics. The second stage involved comparisons with other samples reported by

Kolb and others. It is from this latter analysis that the more interesting findings flow.

Within sample comparisons yielded clear distinctions among the practitioner subsets on "concrete experience" and "abstract conceptualization". Most striking was the configuration presented by clinical dietetics. This is a new profession still concerned with establishing itself and there was a high rating on concrete experience along with a very low rating on abstraction. Comparison with previous data sets generated by research using Kolb shows that, in general, the professional practitioners show profiles more differentiated than those of student populations (see Figure 2). The most interesting evidence is a corroboration of the process Kolb described as "integration" of learning styles among architects. He suggests three broad developmental stages of the human growth process - acquisition, specialization, and integration. Within the third stage, individuals integrate all four cognitive styles. Apparently, this integration is accelerated by the conditions of day-to-day practice whether in client-based or institution-based professions.

For the design of learning units to be used as part of a continuing professional education program, these data are useful. They provide a sense of the instructional strategies to be avoided rather than any strong endorsement of particular methods.

Importance of the Study

Of operational significance is the fact that this study extended information about the LSI into a rather large sample of professional practitioners. The confirmation of one conceptual component of the formulation, the integration of learning styles, and the notice of acceleration under conditions of practice is an addition to the literature. Of practical importance is the demonstration that a learning style analysis can be of value in the process of program design.

KOLB'S LEARNING STYLE INVENTORY (LSI)

Conceptual and Theoretical Base

Developmental theory has included several descriptions of cognitive growth processes (Erikson, 1959; Kohlberg, 1976; Loevinger, 1976; Perry, 1970; Piaget, 1964). All suggest that the individual developmental process can be seen as stages of development and each emphasizes the primacy of specific abilities during these stages. Kolb utilizes the Jungian (Jung, 1923) concept of styles or types of learning which stresses the idea that adult development is characterized by higher levels of integration. Similar to Whitehead's (1968) stages of development, Kolb (Kolb and Fry, 1975) posits three stages of the human growth process: Acquistion; Specialization; and Integration.

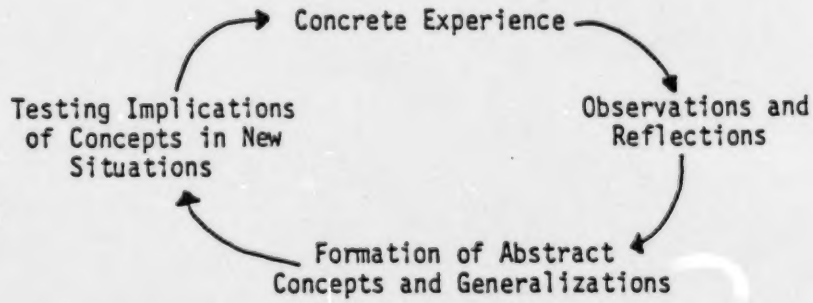
> The first stage, Acquisition, extends from birth to adolescence and marks the acquisition of basic learning abilities and cognitive structures. The second stage, Specialization, extends through formal education and/or career training and the early experiences of adulthood in work and personal life. In this stage, development primarily follows paths that accentuate a particular learning style. Individuals shaped by social, educational and organizational socialization forces develop increased competence in a specialized mode of adaptation that enables them to master the particular life tasks they encounter in their chosen career (in the broadest sense of that word) path. This stage, in our thinking, terminates at mid-career, although the specific chronology of the transition to stage three will vary widely from person-to-person and from one career path to another. The third stage, Integration, is marked by the reassertion and expression of the nondominant adaptive modes or learning styles. Means of adapting to the world that has been suppressed and lay fallow in favor of the development of the more highly rewarded dominant learning style now find expression in the form of new career interests, changes in lifestyles, and/or innovation and creativity in one's chosen career (Kolb, 1967:7).

Each stage is marked by increasing complexity and higher levels of integration. Each is also evidenced by the dominance of certain cognitive abilities, with the third stage demonstrating some integration of all of the pri-

mary abilities. Kolb suggests that individuals respond to their environments by adopting particular "specialized modes of adaptation", or learning styles, which allow them to respond to the demands they encounter. He agrees, here, with the work of Ference Marton (Marton and Saljo, 1976) which suggests that students adapt their learning styles to what is expected of them. Hence, according to Kolb, different academic disciplines demand different learning styles and students of these disciplines evidence significant variations which relate to both their choice of major by discipline and the subsequent reinforcement by experience in that field.

Kolb's conceptualization of these cognitive abilities and learning styles grows out of the earlier work of Kurt Lewin (1976) in social psychology. This experiential learning theory approach places emphasis on the role of experience in the learning process and is described by a learning cycle approach to "how experience is translated into concepts which in turn are used as guides in the choice of new experience" (Kolb, 1976:2).

The Experiential Learning Model


Concrete Experience
Observations and Reflections
Formation of Abstract Concepts and Generalizations
Testing Implications of Concepts in New Situations

Kolb indicates that the four abilities of importance within the dialectical model are: Concrete Experience (CE); Reflective Observation (RO); Abstract Conceptualization (AC); and Active Experimentation (AE). All four are needed by the learner. "That is, (she/)he must be able to involve (her/) himself fully, openly, and without bias in new experiences from many perspec-

tives (RO); to create concepts that integrate (her/)his observations into logically sound theories to make decisions and solve problems (AE)" (Kolb, 1976:3). Formal education produces both a culture and specialized orientations to learning into which individuals are socialized. Different disciplines, according to Kolb, evidence variations among primary tasks, technologies, criteria for truth, academic excellence, methodological strategies, and productivity. Each also holds certain norms governing personal attitudes, styles, and relationships. Therefore, most students develop learning styles within these environmental settings which emphasize some learning abilities over others and which reflect the disciplinary orientation or career path they have selected.

Kolb's model further asserts that learning requires abilities that are polar opposites so that the learner is continually forced to choose which set of abilities to bring to a specific task. He describes two dimensions to the learning process:

1) Concrete Experiencing of Events ——— Abstract Conceptualization

2) Active Experimentation ——— Reflective Observation

Kolb's LSI measures differences in learning styles along the two basic dimensions of abstract-concrete, and active-reflective. The concrete-abstract dimension is suggested throughout the work of cognitive psychologists (e.g., Bruner, 1960, 1966; Harvey, Hunt & Schroeder, 1961). The active-reflective dimension, according to Kolb (1976), describes thought as becoming more reflective and internalized as growth occurs.

Over time, Kolb (1976) sees the dialectic tensions between these dimensions as "consistently resolved in a characteristics fashion." Through

socialization processes, the conflicts between being active and reflective and between immediate and analytical are resolved, and individuals tend toward one of four basic learning styles. According to Kolb (1976), these are the Converger, whose dominant learning abilities are Abstract Conceptualization (AC) and Active Experimentation (AE); the Diverger, with strengths in Concrete Experience (CE) and Reflective Observation (RO); the Assimilator, whose dominant areas are Abstract Conceptualization (AC) and Reflective Observation (RO); and the Accommodator, with the opposite strengths of Concrete Experience (CE) and Active Experimentation (AE).

Purpose and Description

Kolb's Learning Style Inventory (LSI) was developed by him to measure these learning styles. It measures individual's relative emphasis on the learning abilities of Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE), which are described earlier. In addition, it provides measurement on two combined scores that "indicate the extent to which an individual emphasizes abstractness over concreteness (AC-CE) and the extent to which an individual emphasizes action over reflection (AC-RO)" (Kolb, 1976:1).

The LSI is formed as a nine-item self-description questionnaire. The respondent is asked to rank order four words for each item according to the way she/he best describes her/his learning style. Each of the four learning abilities is represented by a descriptive term. In selecting the term which the respondent feels best describes her/his learning style, the respondent is placing her/himself into one of the four learning modes, thereby requiring the respondent to resolve the opposing decisions between abstract-concrete and active-reflective orientations. For example, one item asks respondents to rank order "feeling," "watching," "thinking," and "doing" as they feel each

represents their learning style. For this example, "feeling" represents Concrete Experience, "watching" depicts Reflective Observation, "thinking" is used to represent Abstract Conceptualization, and "doing" corresponds to Active Experimentation.

The combined scores are determined by subtracting the CE score from the AC score to give the AC-CE combination, and by subtracting the RO score from the AE score to yield the AE-RO score. The respondents may then plot their scores along an AE-RO axis and an AC-CE axis which places them into the Accommodator, Diverger, Converger, or Assimilator quadrant. The LSI provides the respondent a summary of descriptions of each learning-style type for their further study and understanding.

Research Findings (Summary)

Kolb and others have identified the four types of learning styles discussed earlier (Converger, Diverger, Assimilator, and Accommodator) as statistically prevalent. Based on the research of Kolb with over 800 subjects, including senior medical students at Boston University, M.I.T. master students in management, M.I.T. Sloan Fellows, and practicing managers from an industrial firm, these patterns emerge to characterize the Converger as having the greatest strength in practical application of ideas. The Converger's knowledge "is organized in such a way that, through hypothetical-deductive reasoning, (she/)he can focus it on specific problems. Liam Hudson's (1966) research in this style of learning (using measures other than the LSI) shows that Convergers are relatively unemotional, preferring to deal with things rather than people. They tend to have narrow interests, and choose to specialize in the physical sciences. Our research shows that this learning style is characteristic of many engineers" (Kolb, 1976:5).

The Diverger's greatest strength lies in her/his imaginative ability according to Kolb's research. She/he has great ability in viewing "concrete situations from many perspectives and to organize many relationships into a meaningful 'gestalt'" (Kolb, 1976:5). The Diverger excels in generation of ideas, and tends to be interested in people, to be imaginative and emotional. Kolb's research indicates that they often specialize in the arts and that this style is "characteristic of persons with humanities and liberal arts backgrounds. Counselors, organization development consultants, and personnel managers often have this learning style" (Kolb, 1976:5).

The research shows the Assimilator to have strengths in the ability to create theoretical models, to excel in inductive reasoning, "in assimilating disparate observations into an integrated explanation (Grochow, 1973)" (Kolb, 1976:6). The style emphasizes abstract concepts over interest in people. The precision of a theory is more important than its potential utilitarian value. "As a result, this learning style is more characteristic of the basic sciences and mathematics rather than the applied sciences. In organizations this learning style is found most often in the research and planning departments (Kolb, 1976; Strasmore, 1973)" (Kolb, 1976:6).

The Accommodator's strength is "in doing things, in carrying out plans and experiments and involving (her/)himself in new experiences. (She/)he tends to be more of a risk-taker than people with the other three learning styles" (Kolb, 1976:6). Adapting to specific circumstances and intuitive problem solution are characteristics of this style. The Accommodator prefers to rely on the expertise of others rather than on her/his own analytical ability (Stabell, 1973), and is sometimes viewed as impatient. The Accommodator's "educational background is often in technical or practical fields such as business. In organizations, people with this learning style are found in "action-oriented jobs, often in marketing or sales" (Kolb, 1976).

Kolb's research using the LSI also shows a "slight tendency toward increasing abstractness as one grows older. The relationship between the Active-Reflective dimension and age is curvilinear" (Kolb, 1976:24). Kolb cautions that these findings should be viewed cautiously, as the sixteen to twenty year age group in this research was made up exclusively of women.

Correspondence between learning style (as measured by Kolb using the LSI) and undergraduate majors seems fairly consistent throughout Kolb's research (1973; 1976). The data show that "one's undergraduate education is a major factor in the development of (her/)his learning style. Whether this is because individuals are shaped by the field they enter or because of selection processes that put people into and out of disciplines is an open question at this point. Most probably both factors are operating..." (Kolb, 1976:32).

The research of Kolb also indicates a strong relationship between LSI scores in adulthood and undergraduate college majors. He demonstrates these relationships as extending from five to twenty-five years. He explains this phenomena by hypothesizing that "stable behavior patterns in learning style are not solely determined by personality consistency or situational consistency, but by a stable pattern of interaction between personal characteristics and situations. In cybernetic terms, behavioral stability results from a positive feedback loop that links personal dispositions, personal choices, and the experiences that result from these choices such that dispositions lead to choices of experiences that are consistent with and thereby reinforce the original dispositions" (Kolb, 1976:19).

THE CONTINUING PROFESSIONAL EDUCATION (CPE) DEVELOPMENT PROJECT AT PENN STATE

The Context for Using LSI

Now in its fifth year, the Continuing Professional Education Project operates under sponsorship from the Kellogg Foundation, the cooperating professional associations, and The Pennsylvania State University. The central aim of the work is to generate learning "packages" or experiences that reflect closely and accurately the needs of the practice situation. The analysis of the practice situation, the selection of high priority needs that are amenable to educational attention, and the creation of learning materials in a wide range of presentational forms and delivery modes constitute the central processes of the Project. In those processes, there is a major emphasis on collaboration between experienced practitioners and knowledgeable professors, between the profession and the University. There are five professions participating in the project: accountants, architects, clinical dietitians, clinical psychologists, and nurses. However, clinical psychologists, because their level of self-knowledge was beyond that offered by the instrument, were not included in the present study.

Since the target population for CPE is experienced, mid-career practitioners, it is desirable from several viewpoints to know something of the characteristic learning styles. Simple educational efficiency is one. The nature of the learner is best considered before materials are created. Efficiency of another sort is important to the participants because professionals often must forego income to give time for continuing professional education. Mature practitioners expect authenticity at the outset in any materials intended for instruction (Black, 1979). Of practical importance is the question of whether the professions are mostly similar or strikingly different in their learning propensities.

Relevant Questions

Several simply stated questions can be illuminated by the analysis of these data. To what degree are there learning style differences and similarities among our four professions? Are differences and similarities captured by learning mode scores, by combination scores, or both? What do comparisons of these samples with those in previous LSI studies reveal? Do the intercorrelations in this sample display the consistency reported for multiple populations? There is a very practical question as well: What presentational modes should be avoided with which practitioners?

The Administration of the Learning Style Inventory

In the course of identifying and confirming those educational needs that arise from the practice situation in our four subject professions, one or two day assessment workshops were conducted. Throughout the simulation, exercises, and tests there was heavy emphasis on self-assessment and individuals received little formal feedback. The LSI was presented as an additional opportunity to learn about one's self.

Individuals retained the whole copyright LSI package, "Self-scoring Test and Interpretation Booklet." They turned in a duplicate score sheet with no identification marks. Only five assessment participants did not return the blind answer sheet.

Participants

All LSI respondents were participants in the CPEDP's practice assessment conducted for the purpose of identifying continuing professional education needs. A total of 148 practitioners responded to the LSI; this group included 41 accountants, 27 architects, 35 clinical dietitians, and 45 nurses. Assessment participants were volunteers; however, for all professions they represented a range of experience, practice settings, and abilities.

Analyses

Intercorrelations among the four learning style scores for the total sample were calculated to examine the underlying experiential premises of Kolb's theory. Learning style similarities and differences were examined across the professions using a one-way ANOVA with follow-up comparisons made via the Waller-Duncan K Ratio T Test. The combined scores across the professions are analyzed by a 2 x 4 MANOVA.

RESULTS

The intercorrelations between the learning mode scores for our sample of 148 professions allow comparison with Kolb's report on 807 people (p. 10 Technical Manual). In his data, "CE and AC were negatively reported (-.57, $p < 0.001$)." In the current sample the CE/AC correlation was -.45, $p < 0.0001$. Kolb reports that "RO and AE were negatively correlated (-.50, $p < .001$)." For our total sample, RO/AE were correlated -.46, $p < 0.0001$. Thus we can infer that two of the conceptual premises from experiential theory, the tension between "concrete" vs. "abstract" and "action" vs. "reflection," are in evidence.

The individual professions can be briefly described on the basis of the score distributions shown in Table 1. To give a benchmark for comparison, we established the range and mid-points for all the sample groups listed by Kolb (T-5; see also Figure 2). Accounting is low on CE and RO which fits in with the treatment of individual cases as they come up using prestructured procedures rather than judgment based on new observations. This orientation is reinforced by the high AC score and very high AE score. There is an analytical approach to situations and an emphasis on meticulous performance. The "experimentation" label is a bit misleading because in this case the practitioner meets a succession of new cases, each distinct in its details.

Architects display the attributes of Kolb's third stage, "integration," and it comes through rather clearly. The scores are very close to the mid-points of all the groups but on the low side on Active Experimentation. The axial scores, AC-CE and AE-RO, are both low. This is a mature profession with a long history of self awareness and skill in working with clients, contractors, and financial people. The balance across the scores reflects that diverse experience and reflects, too, that mixture of art and practicality the profession must cultivate to survive. On the quadrant plot (see Figure 1), our sample is still in the sector with architecture students but they have moved toward action and away from reflection, what Kolb calls ". . . the reassertion of non-dominant modes."

Clinical dietetics, by way of contrast, is a new profession. They have low scores on concrete experience but high on the others, very high on the action component. The profession is very concerned with the provisions and situations for practice and with the principles that should underlie them. There is an emphasis on logic and rationality in defining the scope of the profession and, perhaps, even an effort to get free of the limits of the current conditions of practice. This is the configuration one might hypothesize on the basis of Kolb's fomulations for an emerging profession.

The nursing group has a very high score on concrete experience and values near the mid-point of the reported ranges for the others. This pattern fits well with the current state of the nursing profession. Concepts, definitions, and values are focused on the immediate situation. The established "observed" situation is under challenge, not through abstract analysis, but rather through the issues arising from patient care situations.

Are there differences among the professions? The ANOVAs show significant but small differences across the four professions on all four scales. Widest dispersions are found on the abstract-concrete axis.

The Waller-Duncan follow-up comparisons of the means indicate the following patterns of differences across the four groups. On the Concrete Experience mode, nurses and architects are similar and significantly different from dietitians and accountants. However, when architects are compared with dietitians alone they are similar, that is to say not significantly different.

When Reflective Observation is considered the pattern is simpler. Nurses, architects, and accountants show no significant difference. Architects and nurses differ from the dietitians but there is some overlap with accountants.

On the Abstract Conceptualization dimension, dietitians, accountants, and architects show no significant difference. All three stand apart from nurses.

Active Experimentation shows a more complex pattern. Accountants, dietitians, and nurses are not significantly different. Architects stand apart from accountants and dietitians but they are not significantly separated from the nurses.

The MANOVA using Wilk's Criterion shows that the four groups differ significantly in their predominant learning style; that is, the quadrant into which they fall based on their combination scores ($f = 5.04$, $p = <.0001$). Nurses and architects are divergers; dietitians and accountants are accommodators. A second question to be considered is how the experienced professionals in this sample might differ from groups reported previously. We have plotted the combination scores for the four professions on the axis AC-CE and AE-RO as displayed in Table 5 of Kolb's Technical Manual (see Figure 1). Accountants fall very close to business majors in the "accommodator" quadrant. Clinical dietitians are found in the same quadrant, somewhat further out on both axes. Architects, as we have noted above, fall in the same quadrant with architectual students. They are still "divergers" but moved toward the accom-

modator category. It is nursing that shows a striking difference falling in the "diverger" quadrant in contrast to a previous position, admittedly for a small sample of 13, in the "converger" sector. In general, one can discern the maturing effects of professional practice on the learning styles of these subjects.

CONCLUSIONS

The Learning Style Inventory may have some utility with groups of mature practitioners in selected professions. The premises and dimensions worked out with students and other younger populations can carry explanatory power when applied to mid-career professionals. The patterns appear to show some of the effects of broader trends at work on the profession. The dietitians and architects are notable in this regard.

A presumed utility of the LSI is to use the results as a guide for the design of learning materials. The model asserts that such information will improve the efficiency of the learning packages by whatever method the needs are derived. Using the relationships reported by Kolb, the following guidance is provided for the four groups.

With accountants use case studies and projects, some small group discussion, student exchange and feedback, and some take-home work. Do not use lectures and seminars, research papers, examinations, or individual tutorial conferences.

With architects whose scores are balanced across the four learning mode categories, a wide range of options is open, but seminars, small group discussions, and formal papers should be avoided.

Clinical dietitians are likely to respond to the use of: case studies and projects, small group discussions, some readings on theory, and independent thinking. Do not use lectures and sem-inars, research papers, faculty feedback and tutorials, "talks by experts."

For nurses use small group discussions, projects, student interaction, and some take home assignments. Do not use lectures or readings on theory.

These recommendations are derived directly from Kolb's model for learning preferences and are in a sense, predictions to be confirmed, rejected, or modified according to other information or data. While the present study did not attempt to examine these predictions, and it does not have direct evidence bearing on the questions, indirect data are available. As part of a broad-scale assessment of a sample of Pennsylvania practitioners from five professions, the subjects were asked, "By what methods do you learn best?" They were given eight options and asked to check as many as applied. While there were some rather large differences between the four professional groups under consideration, small group sessions, workshops, demonstrations, and self-study tended to be the top four choices. The top preference for each group and the percentage endorsing it are: small group sessions (Accounting -- 78 percent; Clinical Dietetics -- 79 percent), workshops (Nursing -- 65 percent; Architecture -- 55 percent). For the latter group, it is interesting to note that their profile of preferences tends to be flat in accordance with the model's predictions. However, self-study was the second preferred method for architects, and endorsed by 48 percent, in contradiction to the model.

This study has touched on the issues of how well the learning preferences of the four groups conform to the model's predictions and the utility of the LSI in designing learning packages. It appears that this LSI can provide some confirming evidence in the contradiction of continuing professional education programs. However, additional research using the LSI with professionals is necessary before its utility, other than as a heuristic device for self-reflection, can be demonstrated.

TABLE 1

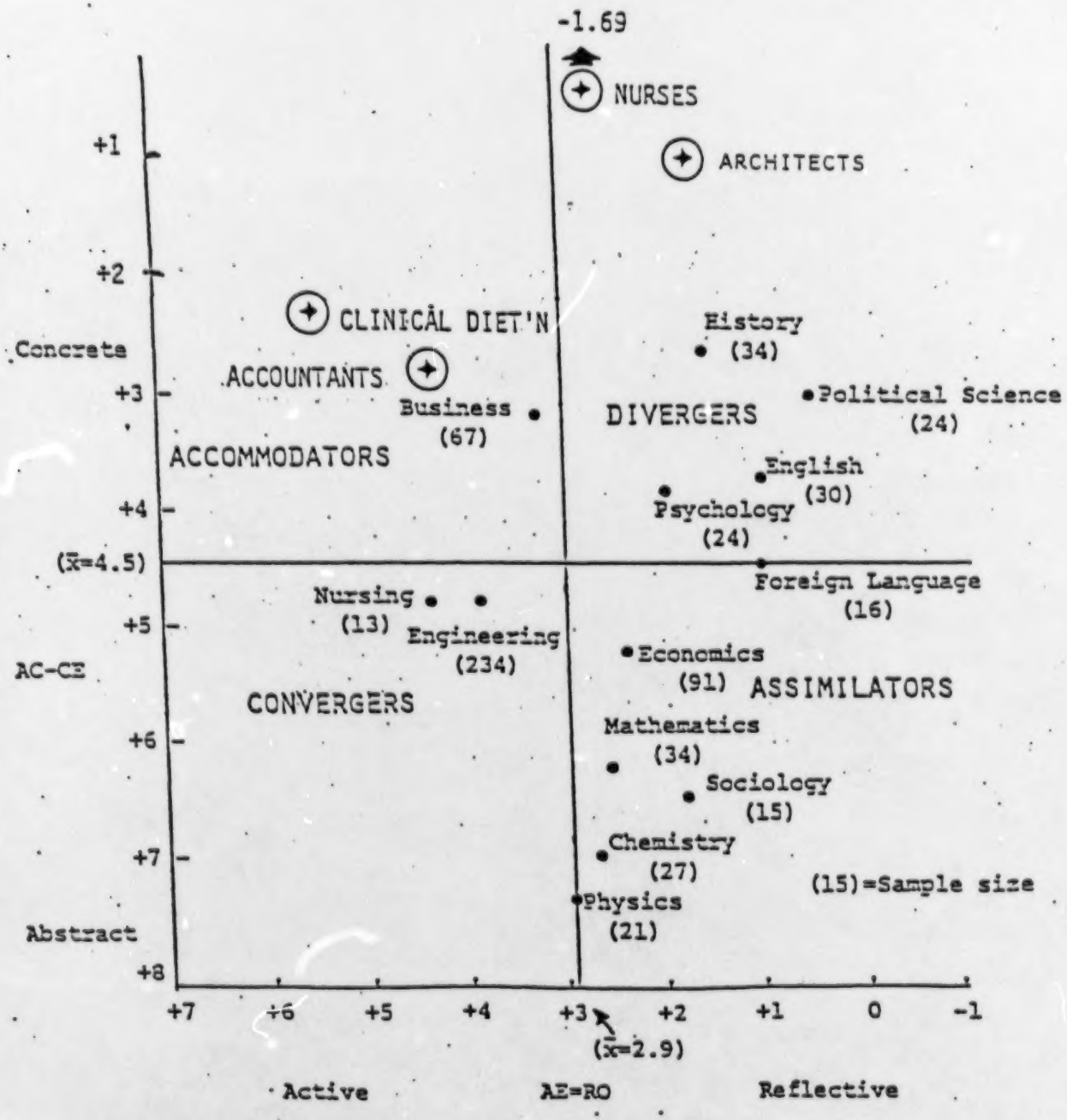
COMPARISON OF KOLB LEARNING STYLE INVENTORY (LSI)
SCORES ACROSS FOUR PROFESSIONS

Profession	LSI Score					
	CE	RO	AC	AE	AC-CE	AE-RO
All (n = 148)						
M	15.36	13.01	16.47	16.61		
sd	(3.02)	(3.38)	(3.43)	(2.95)		
Accounting (n = 41)						
M	14.29	13.02	17.20	17.34	2.90	4.32
sd	(3.02)	(2.98)	(3.07)	(3.00)	(5.10)	(5.15)
Architecture (n = 27)						
M	15.70	13.67	16.74	15.30	1.04	1.63
sd	(2.98)	(3.66)	(3.90)	(2.67)	(5.67)	(4.54)
Clinical Dietitians (n = 35)						
M	14.57	11.63	17.26	17.17	2.68	5.54
sd	(2.91)	(3.04)	(3.14)	(2.98)	(5.23)	(5.17)
Nursing (n = 45)						
M	16.73	13.69	15.04	16.29	-1.69	2.60
sd	(2.60)	(3.56)	(3.31)	(2.83)	(4.86)	(5.78)
f	6.36	3.02	4.13	3.37	7.12	3.64
p	0.0005	0.03	0.008	0.02	0.0002	0.0144

FIGURE 1. AVERAGE LSI SCORES ON ACTIVE/REFLECTIVE (AE-RO) AND ABSTRACT/CONCRETE (AC-CE)

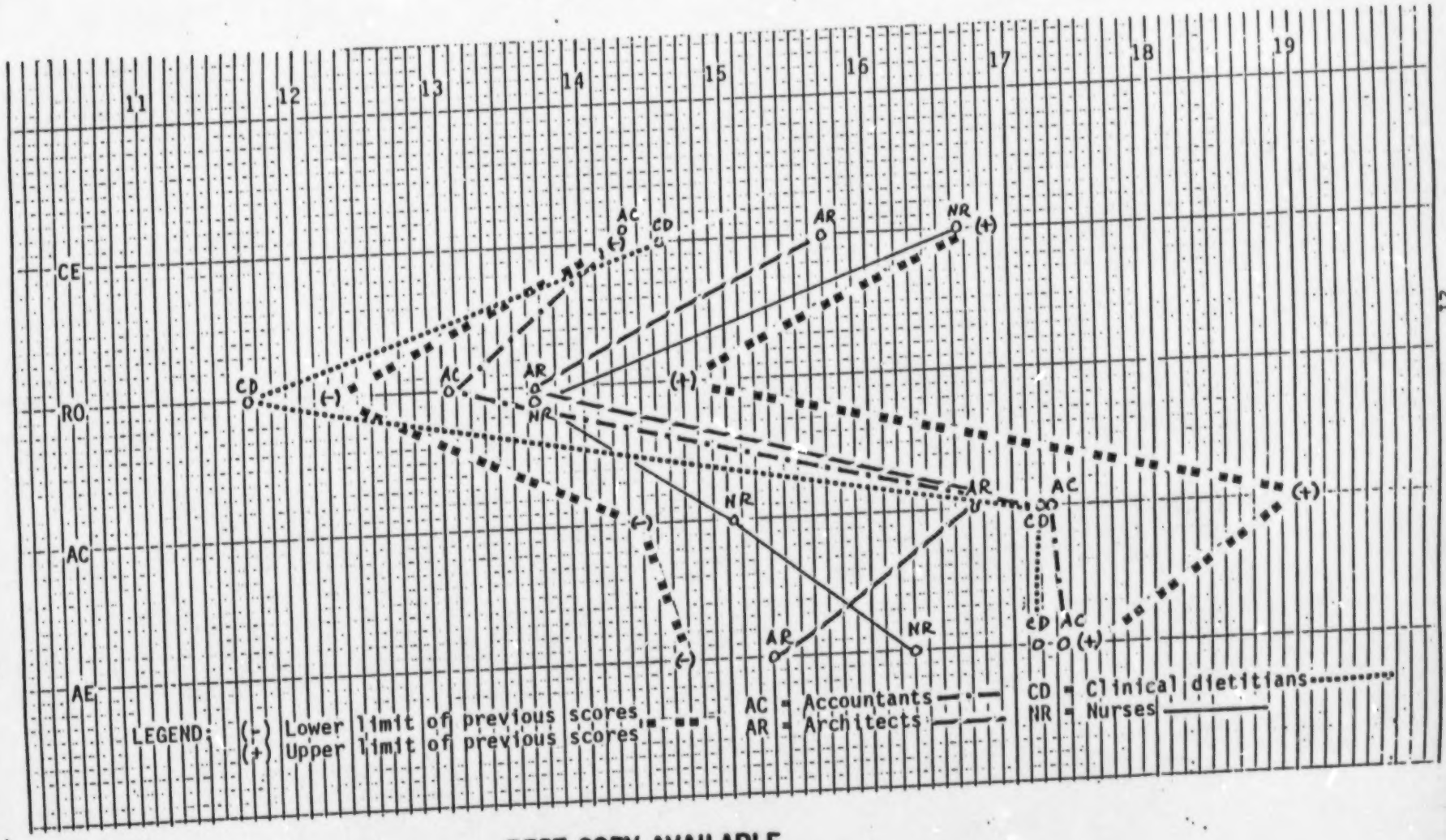
by Undergraduate College Major

PROFESSIONS FROM PENN STATE STUDY ADDED



BEST COPY AVAILABLE

FIGURE 2. LEARNING STYLE INVENTORY (LSI) SCORES OF PROFESSIONALS BY LEARNING MODE
Showing Previously Reported Limits



BEST COPY AVAILABLE

REFERENCES

Astin, A. Four Critical Years. San Francisco, CA: Jossey-Bass, 1977.

Bennett, N. Learning Styles of Health Professionals Compared to Preference for Continuing Education Format. Ph.D. dissertation, University of Illinois, College of Medicine, 1979.

Black, G. J. Trends in Management Development and Education. White Plains, NY: Knowledge Industry Publishers, 1979.

Blakeley, J. The Relative Influence of Formal and Informal Organization Structure on Learning. Master's Thesis, M.I.T. Sloan School of Management, 1972.

Bowen, H. Adult Learning, Higher Education, and the Economics of Unused Capacity. New York, NY: College Entrance Examination Board, 1980.

Bowen, H. Investment in Learning. San Francisco, CA: Jossey-Bass, 1980.

Bruner, J. S. The Process of Education. New York, NY: Atheneum, 1966.

Bruner, J. S. Toward a Theory of Instruction. New York, NY: W. W. Norton, 1966.

Burston, B. Correlation Between Scores on Learning Modes and Scores on Representational Categories. Unpublished paper, Ontario Institute for Studies in Education, 1979.

Carlsson, B., Keane, P., and Martin, J. B. "R & D Organizations as Learning Systems." Sloan Management Review, 17(3), 1976.

Chickering, A. Education and Identity. San Francisco, CA: Jossey-Bass, 1969.

Chickering, A. Experience and Learning: An Introduction to Experiential Learning. New Rochelle, NY: Change Magazine Press, 1977.

Clinchy, B., and Zimmerman, C. "Cognitive Development in College." Unpublished Manuscript, Wellesley College, 1975.

Cross, K. P. Accent on Learning: Improving Instruction and Reshaping the Curriculum. San Francisco, CA: Jossey-Bass, 1976.

Cross, K. P. Adults as Learners. San Francisco, CA: Jossey-Bass, 1981.

Doherty, A., Mentkowsky, M., and Conrad, K. "Toward a Theory of Undergraduate Experiential Learning." Keeton, M. and P. Tada (Editors) Learning by Experience--What, Why, How. San Francisco, CA: Jossey-Bass, 1978, pp. 23-36.

Eden and Mathis. The Impact of An Experiential Learning Approach on Student Learning Styles. Unpublished paper, 1977.

Erikson, E. "Identity and the Life Cycle." Psychological Issues Monograph, Volume 1 (1). New York, NY: International Universities Press, 1959.

Flauell, J. The Developmental Psychology of Jean Piaget. New York, NY: VanNostrand Reinnold Company, 1963.

Friedman, R., and Stumpf, S. "What Can One Learn from the Learning Style Inventory?" Academy of Management Journal, 1977, 21, pp. 275-282.

Fry, R. Diagnosing Professional Learning Environments: An Observational Scheme for Matching Learner Style with Situational Complexity. Doctoral dissertation, M.I.T. Sloan School of Management, 1978.

Gish, G. Integrated Learning: A Process Model. Qualifying Paper, Case Western Reserve University, Department of Organizational Behavior, 1979.

Goldman, M. Learning Style Influence on Career Decision. Master's thesis, M.I.T. Sloan School of Management, 1972.

Goldstein, K., and Blackman, S. Cognitive Style: Five Approaches and Relevant Research. New York, NY: Wiley and Sons, 1978.

Goldstein, K., and Scheerer, M. "Abstract and Concrete Behavior: An Experimental Study with Special Tests." Psychological Monographs, 53 (239).

Gould, R. "The Phases of Adult Life: A Study in Developmental Psychology." American Journal of Psychiatry, 1972, 129, pp. 521-531.

Griggs, W. On the Measurement of the Learning Press of Technical Work Environments. Ph.D. dissertation, Case Western Reserve University, Department of Organizational Behavior, 1979.

Grochow, J. Cognitive Style as a Factor in the Case of Interactive Computer Systems for Decision Support. Doctoral dissertation, M.I.T. Sloan School of Management, 1974.

Guilford, J. P. "Cognitive Styles: What are They?" Educational and Psychological Measurement, 1980, 40, pp. 715-735.

Harvey, O. J., Hunt, D., and Schraeder, H. Conceptual Systems and Personality Organization. New York, NY: John Wiley and Sons, 1961.

Heath, D. Growing Up in College. San Francisco, CA: Jossey-Bass, 1968.

Heath, D. Maturity and Competence: A Transcultural View. New York, NY: Gardner Press, 1977.

Heath, R. "Personality and the Development of Students in Higher Education." Parker, C. (Editor), Encouraging Development in College Students. Minneapolis, MN: University of Minnesota Press, 1978.

Heath, R. The Reasonable Adventurer. Pittsburgh, PA: University of Pittsburgh Press, 1964.

Hofer, B. A Suggested Correlation Between Learning Style and Ego Development. Unpublished paper, Harvard Graduate School of Education, 1977.

Holland, J. L. The Psychology of Vocational Choice: A Theory of Personality Types and Model Environments. Wathore, MA: Blaisdell, 1966.

Jung, C. G. Psychological Types. London, England: Pantheon Books, 1923.

Kagan, J., et al. "Information Processing in the Child: Significance of Analytic and Reflective Attitudes." Psychological Monographs, 1964, 78(1).

Kidd, J. R. How Adults Learn. New York, NY: Association Press, 1973.

King, P. M. The Development of Reflective Judgment and Formal Operational Thinking in Adolescents and Young Adults. Unpublished doctoral dissertation, University of Minnesota, 1977.

Knefelkamp, L. L., and Slepitza, R. L. "A Cognitive-Developmental Model of Career Development -- An Adaptation of the Perry Scheme." The Counseling Psychologist, 1976, 6, pp. 53-58.

Knowles, M. S. The Adult Learner: A Neglected Species. Houston, TX: Gulf, 1978.

Knox, A. B. Adult Development and Learning: A Handbook on Individual Growth and Competence in the Adult Years for Education and the Helping Professions. San Francisco, CA: Jossey-Bass, 1977.

Knox, A. B. (Editor) Teaching Adults Effectively. San Francisco, CA: Jossey-Bass, 1980.

Kohlberg, L. "Stage and Sequence: The Cognitive-Developmental Approach to Socialization." Goslin, D. P. (Editor), Handbood of Socialization Theory and Research. Chicago, IL: Rand-McNaly, 1969.

Kolb, D. A. Individual Learning Styles and the Learning Process. Working Paper #535-71, M.I.T. Sloan School of Management, 1971.

Kolb, D. A. "On Management and the Learning Process." California Management Review. Spring, 1976.

Kolb, D. A. Learning Style Inventory: Technical Manual. Boston, MA: McBer and Company, 1976.

Kolb, D. A. Applications of Experiential Learning Theory to the Information Sciences. Unpublished paper, National Science Foundation Conference on Behaviorial Science and Information Science, December 11-14, 1978.

Kolb, D. A. "Disciplinary Inquiry Norms and Student Learning Styles: Diverse Pathways for Growth." Chickering, A. (Editor), The Future American College. San Francisco, CA: Jossey-Bass, 1978.

Kolb, D. A., and Fry, R. E. "The Application of Experiential Learning Theory to the Design of Learning Experience in Liberal Arts Education." Althod, J., et al (Editors), New Directions for Experiential Learning. San Francisco, CA: Jossey-Bass, in press.

Kolb, D. A., and Fry, R. E. "Toward an Applied Theory of Experiential Learning." Cooper, C. (Editor), Theories of Group Processes. London, England: John Wiley and Sons, 1975.

Kolb, D. A., and Goldman, M. Toward a Typology of Learning Styles and Learning Environments: An Investigation of the Impact of Learning Styles and Discipline Demands on Academic Performance, Social Adaptation, and Career Choices of M.I.T. Seniors. Working paper #652-73, M.I.T. Sloan School of Management, 1973.

Kolb, D. A., and Plovnick, M. S. "The Experiential Learning Theory of Career Development." Van Marnen, J. (Editor), New Perspectives on Organizational Careers. New York, NY: John Wiley and Sons, 1976.

Kolb, D. A., et al. Organizational Psychology. Englewood Cliffs, NJ: Prentice Hall, 1979.

Kolb, D. A., Rubin, I., and McIntyre, J. "Learning and Problem Solving." Chapter 2 in Kolb, et al., Organizational Psychology: An Experiential Approach. Englewood Cliffs, NJ: Prentice Hall, 1979.

Kris, E. Psychoanalytic Explorations in Art. New York, NY: International Universities Press, 1952.

Karfiss, J. "Sequentiality and Structure in a Cognitive Model of College Student Development." Developmental Psychology, 1977, 13(6), pp. 565-571.

Levinson, D. et al. The Seasons of a Man's Life. New York, NY: Alfred A. Knopt, 1978.

Lewin, K. A Dynamic Theory of Personality. New York, NY: McGraw-Hill, 1935.

Lewin, K. Field Theory as Human Science. New York, NY: Gardner Press, 1976.

Lewis, R., and Margerison, C. Working and Learning -- Identifying your Preferred Ways of Doing Things. Bedfordshire, England: Management and Organization Development Research Centre, Cranfield School of Management.

Lewkowitz, M. The Impact of Client Counselor Learning Style Similarity on Professional and Paraprofessional Counseling. Ph.D. dissertation, California School of Professional Psychology, 1979.

Liapis, G. H., and Seybolt, J. W. The Professional Electrical Engineer: Problem-Solving Methods Characteristic of the Successful Electrical Engineer. Paper presented at the IEEE Region 6 Conference, Spring, 1975.

Lowinger, J. Ego Development: Conceptions and Theories. San Francisco, CA: Jossey-Bass, 1976.

Madison, P. Personality Development During College. New York, NY: Addison-Wesley, 1969.

Manring, S. "Career Patterns of Technically Training Professionals: A Person/Environment Interaction Model." Ph.D. dissertation, Case Western Reserve University, Department of Organizational Behavior, 1979.

Margerison, C. J., and Lewis, R. G. How Work Preferences Relate to Learning Styles. Bedfordshire, England: Management and Organization Development Research Centre, Cranfield School of Management.

Marton, F. "Skill as an Aspect of Knowledge." Journal of Higher Education. 1979, 50(5), pp. 602-613.

Marton, F., and Saljo, R. "On Qualitative Differences in Learning: Outcome and Process." British Journal of Educational Psychology. 1976, 46, pp. 4-11.

Messick, S. Cognitive Styles in Educational Practice. Princeton, NJ: Educational Testing Service, 1982.

Parker, C. A. Encouraging the Development of College Students. Minneapolis, MN: University of Minnesota, 1978.

Pask, G. "Styles and Strategies of Learning." British Journal of Educational Psychology. 1976, 46, pp. 128-148.

Perna, F. An Analysis of Learning Profiles of Managers. Master's thesis, M.I.T. Sloan School of Management, 1970.

Perry, W. G., Jr. Forms of Intellectual and Ethical Development in the College Years. New York, NY: Holt, Rinehart, & Winston, 1970.

Piaget, J. Judgment and Reasoning in the Child. Patterson, NJ: Littlefield, Adams, and Company, 1964.

Piaget, J. Structuralism. New York, NY: Harper and Row, 1968.

Pigg, K. E., et al. "Learning Styles in Adult Education: A Study of County Extension." Adult Education. 1980, Volume 30(4), pp. 233-244.

Plovnick, M. Individual Learning Styles and the Process of Career Choice in Medical Students. Doctoral dissertation, M.I.T. Sloan School of Management, 1974.

Plovnick, M. A Longitudinal View of Learning Styles and Career Choices. Unpublished paper, Clark University, 1978.

Rogers, C. R. On Becoming a Person. Boston, MA: Houghton Mifflin, 1961.

Serrapere, P. A Rationale and Design to Train Adults to Develop their Non-Dominant Learning Styles. Ph.D. dissertation, University of Pittsburgh, Graduate School of Education, 1977.

Singer, J. "The Importance of Daydreaming." Psychology Today. 1968, 1(11), pp. 18-26.

Stabell, C. The Impact of a Conversational Computer System on Human Development Perspective. Master's thesis, M.I.T. Sloan School of Management, 1973.

Strange, C. C. "Intellectual Development, Motive for Education and Learning Styles During the College Years." Unpublished doctoral dissertation, University of Iowa, 1978.

Strasmore, M. The Strategic Function Re-Evaluated from the Organization Development Perspective. Master's thesis, M.I.T. Sloan School of Management, 1973.

Styarge, C. Intellectual Development Motive for Education and Learning Styles During the College Years: A Comparison of Adult and Traditional Age College Students. Ph.D. dissertation, University of Iowa, 1978.

Torrealba, D. Convergent and Divergent Learning Styles. Master's thesis, M.I.T. Sloan School of Management, 1972.

Tough, A. The Adult's Learning Projects. Toronto, Ontario: The Ontario Institute for Studies in Education, 1971, 1979.

Wachtel, P. L. "Style and Capacity in Analytic Functioning." Journal of Personality. 1968, 36, pp. 202-212.

Weathersby, R. A Synthesis of Research and Theory on Adult Development: Its Implications for Adult Learning. Ph.D. qualifying paper. Harvard University Graduate School of Education, 1976.

Weathersby, R. A Developmental Perspective on Adults' Cases of Formal Education. Doctoral dissertation, Harvard University Graduate School of Education, 1977.

Weisner, F. Learning Profiles and Managerial Styles of Managers. Master's thesis, M.I.T. Sloan School of Management, 1971.

Whitehead, A. N. The Aims of Education and Other Essays. New York, NY: Free Press, 1968.

Wolfe, D. M., and Kolb, D. A. Beyond Specialization: The Quest for Integration in Mid-Life. Unpublished paper, Case Western Reserve University,

Wolfe, D. M., and Kolb, D. A. "Career Development, Personal Growth, and Experiential Learning." Kolb, D., I. Rubin, and J. McIntyre (Editors), Organizational Psychology: A Book of Readings. Englewood Cliffs, NJ: Prentice Hall, 1979, pp. 535-563.

Wunderlich, R., and Gjerde, C. "Another Look at Learning Style Inventory and Medical Career Choice." Journal of Medical Education. 1978, 53, pp. 45-54.

Wynne, B. E. Abstraction, Reflection, and Insight -- Situation Coping Style Measurement Dimensions. Working paper, University of Wisconsin, Milwaukee School of Business Administration, 1975-76.